TENTANG PENULIS

Nama lengkap Destria Anggriani lahir di kota Pangkalpinang, Provinsi Kepulauan Bangka Belitung, pada tanggal 28 Juli 1993 dengan alamat tempat tinggal Jl. Bukit Permai 2 No.47 Perumnas Bukit Merapin, Pangkalpinang. Pendidikan formal yang pernah ditempuh, Sekolah Dasar di SD Negeri 10 Pangkalpinang (2005), Pendidikan Menengah Pertama di SMP Negeri 9 Pangkalpinang (2008), Pendidikan Menengah Atas di SMK Negeri 2 Pangkalpinang (2011) dan Pendidikan Strata-1 (S1) di Jurusan Teknik Elektro Konsentrasi Teknik Ketenagalistrikan Universitas Bangka Belitung (2016) dengan judul skripsi yang diambil **"Pengaruh Sudut Picu *SCR* (*Silicon Controled Rectifier*) Terhadap Beban"**.

Email : destria_anggriani@yahoo.com

Pembimbing Utama	Pembimbing Pendamping
Muhammad Jumnahdi, S.T.,M.T.	Tri Hendrawan Budianto, S.T.,M.T
NP. 307010044	NP. 307196007

BTA16-600BW3G, BTA16-800BW3G

Triacs

Silicon Bidirectional Thyristors

Designed for high performance full-wave ac control applications where high noise immunity and high commutating di/dt are required.

Features

- Blocking Voltage to 800 V
- On-State Current Rating of 16 A RMS at 80°C
- Uniform Gate Trigger Currents in Three Quadrants
- High Immunity to dV/dt – 1500 V/μs minimum at 125°C
- Minimizes Snubber Networks for Protection
- Industry Standard TO-220AB Package
- High Commutating dI/dt – 4.0 A/ms minimum at 125°C
- Internally Isolated (2500 V_{RMS})
- These are Pb−Free Devices

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off−State Voltage (Note 1) (T_J = −40 to 125°C, Sine Wave, 50 to 60 Hz, Gate Open) BTA16−600BW3G BTA16−800BW3G	V_{DRM}, V_{RRM}	 600 800	V
On-State RMS Current (Full Cycle Sine Wave, 60 Hz, T_C = 80°C)	$I_{T(RMS)}$	16	A
Peak Non-Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, T_C = 25°C)	I_{TSM}	170	A
Circuit Fusing Consideration (t = 8.3 ms)	I^2t	120	A^2sec
Non−Repetitive Surge Peak Off−State Voltage (T_J = 25°C, t = 10ms)	V_{DSM}/ V_{RSM}	V_{DSM}/V_{RSM} +100	V
Peak Gate Current (T_J = 125°C, t = 20ms)	I_{GM}	4.0	A
Peak Gate Power (Pulse Width ≤ 1.0 μs, T_C = 80°C)	P_{GM}	20	W
Average Gate Power (T_J = 125°C)	$P_{G(AV)}$	1.0	W
Operating Junction Temperature Range	T_J	−40 to +125	°C
Storage Temperature Range	T_{stg}	−40 to +150	°C
RMS Isolation Voltage (t = 300 ms, R.H. ≤ 30%, T_A = 25°C)	V_{iso}	2500	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. V_{DRM} and V_{RRM} for all types can be applied on a continuous basis. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

ON Semiconductor®

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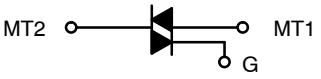
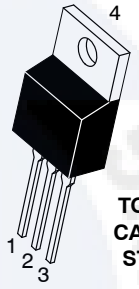
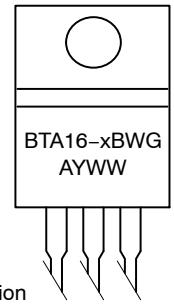
TRIACS
16 AMPERES RMS
600 thru 800 VOLTS





TO−220AB
CASE 221A
STYLE 12

MARKING DIAGRAM



x = 6 or 8
A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

PIN ASSIGNMENT	
1	Main Terminal 1
2	Main Terminal 2
3	Gate
4	No Connection

ORDERING INFORMATION

Device	Package	Shipping
BTA16−600BW3G	TO−220AB (Pb−Free)	50 Units / Rail
BTA16−800BW3G	TO−220AB (Pb−Free)	50 Units / Rail

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

THERMAL CHARACTERISTICS

Characteristic		Symbol	Value	Unit
Thermal Resistance,	Junction−to−Case (AC) Junction−to−Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.13 60	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8″ from Case for 10 seconds		T_L	260	°C

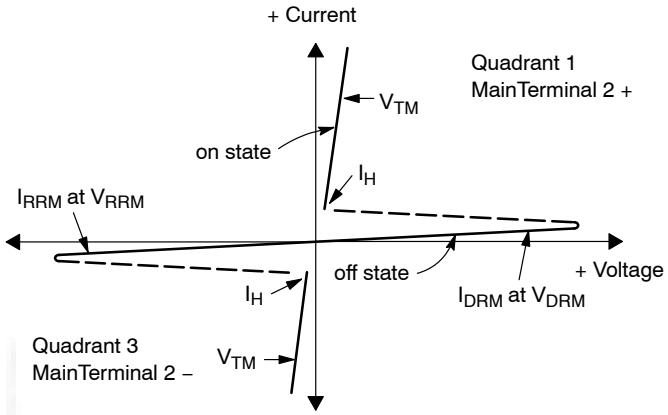
ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted; Electricals apply in both directions)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Peak Repetitive Blocking Current (V_D = Rated V_{DRM}, V_{RRM}; Gate Open)	T_J = 25°C T_J = 125°C	I_{DRM}, I_{RRM}	– –	– –	0.005 2.0	mA
ON CHARACTERISTICS						
Peak On-State Voltage (Note 2) (I_{TM} = ±22.5 A Peak)		V_{TM}	–	–	1.55	V
Gate Trigger Current (Continuous dc) (V_D = 12 V, R_L = 30 Ω) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−)		I_{GT}	 2.5 2.5 2.5	 – – –	 50 50 50	mA
Holding Current (V_D = 12 V, Gate Open, Initiating Current = ±150 mA)		I_H	–	–	60	mA
Latching Current (V_D = 12 V, I_G = 50 mA) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−)		I_L	 – – –	 – – –	 70 90 70	mA
Gate Trigger Voltage (V_D = 12 V, R_L = 30 Ω) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−)		V_{GT}	 0.5 0.5 0.5	 – – –	 1.7 1.1 1.1	V
Gate Non−Trigger Voltage (T_J = 125°C) MT2(+), G(+) MT2(+), G(−) MT2(−), G(−)		V_{GD}	 0.2 0.2 0.2	 – – –	 – – –	V
DYNAMIC CHARACTERISTICS						
Rate of Change of Commutating Current, See Figure 10. (Gate Open, T_J = 125°C, No Snubber)		$(dI/dt)_c$	4.0	–	–	A/ms
Critical Rate of Rise of On−State Current (T_J = 125°C, f = 120 Hz, I_G = 2 x I_{GT}, tr ≤ 100 ns)		dI/dt	–	–	50	A/μs
Critical Rate of Rise of Off-State Voltage (V_D = 0.66 x V_{DRM}, Exponential Waveform, Gate Open, T_J = 125°C)		dV/dt	1500	–	–	V/μs

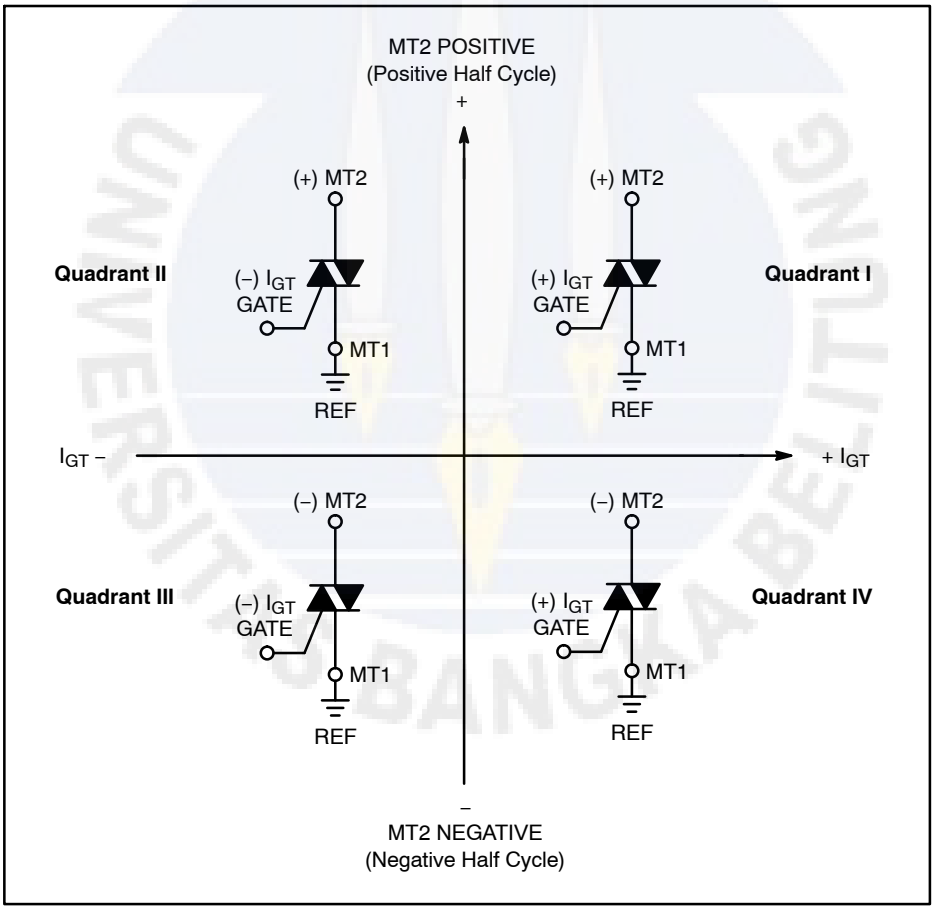
2. Indicates Pulse Test: Pulse Width ≤ 2.0 ms, Duty Cycle ≤ 2%.

Voltage Current Characteristic of Triacs (Bidirectional Device)

Symbol	Parameter
V_{DRM}	Peak Repetitive Forward Off State Voltage
I_{DRM}	Peak Forward Blocking Current
V_{RRM}	Peak Repetitive Reverse Off State Voltage
I_{RRM}	Peak Reverse Blocking Current
V_{TM}	Maximum On State Voltage
I_H	Holding Current



Quadrant Definitions for a Triac



All polarities are referenced to MT1.
With in−phase signals (using standard AC lines) quadrants I and III are used.

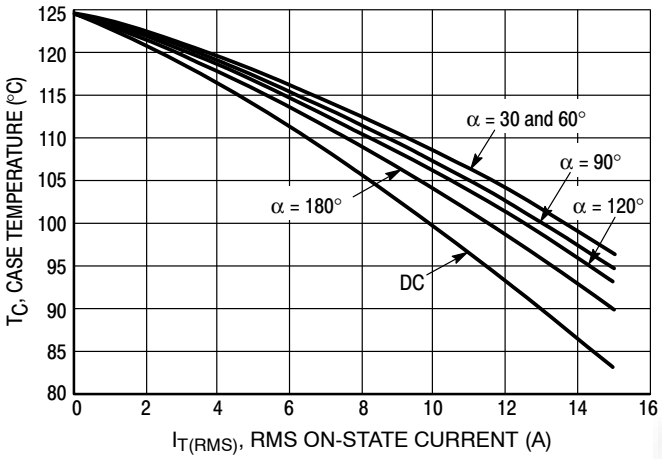


Figure 1. RMS Current Derating

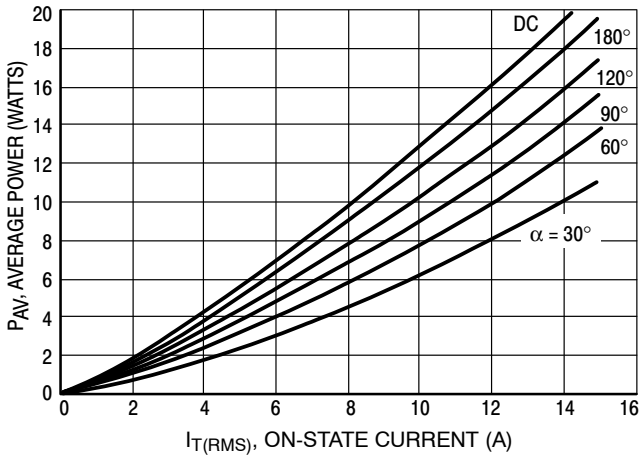


Figure 2. On-State Power Dissipation

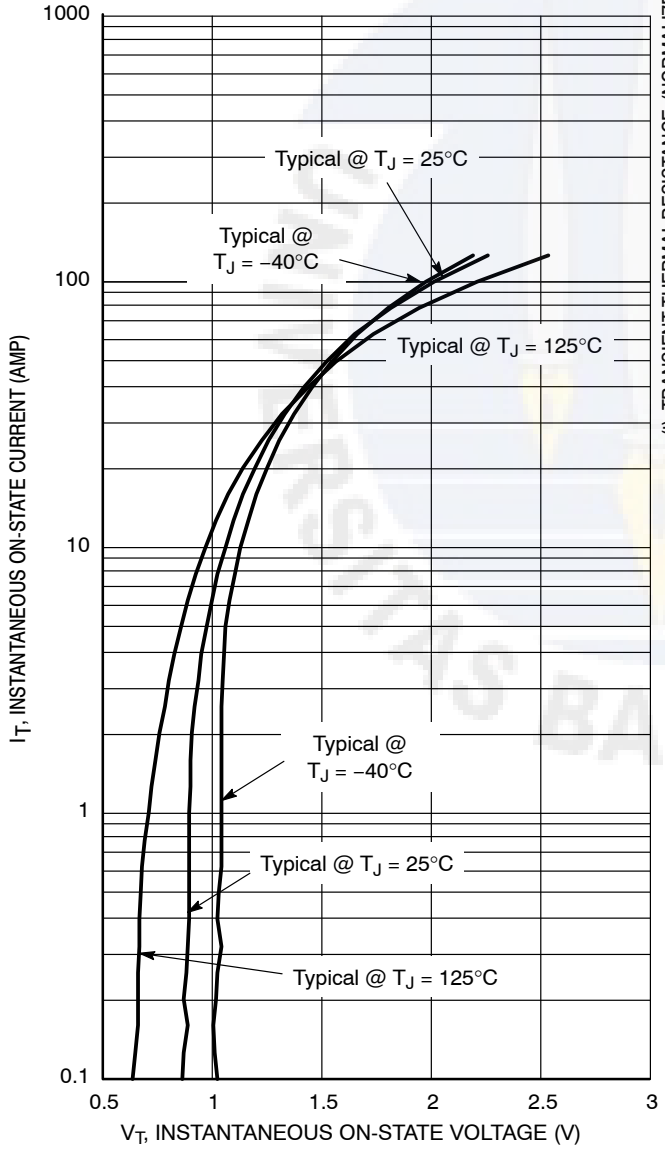


Figure 3. On-State Characteristics

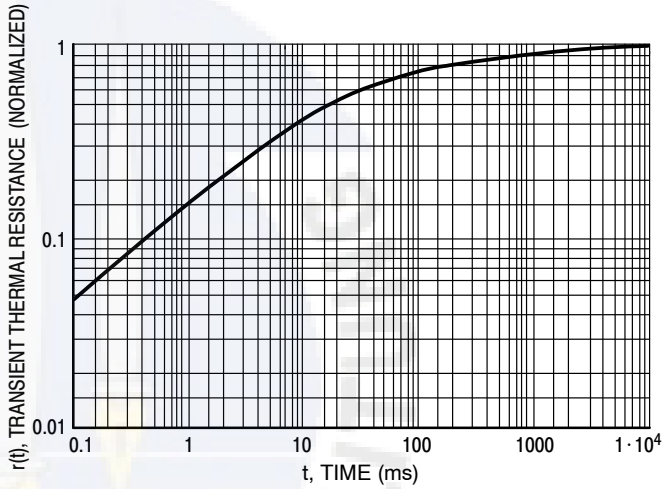
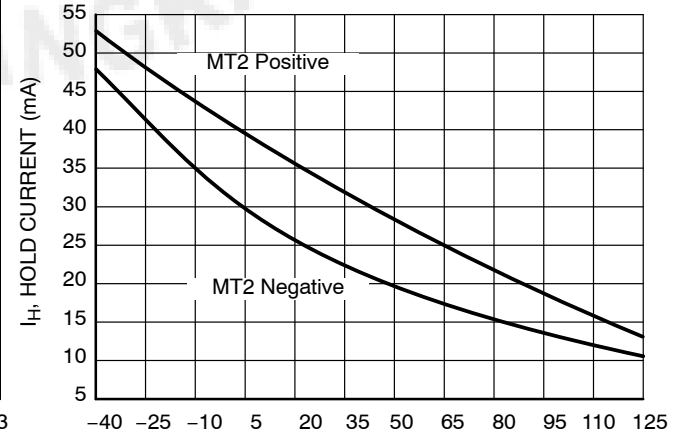


Figure 4. Thermal Response



ent Variation

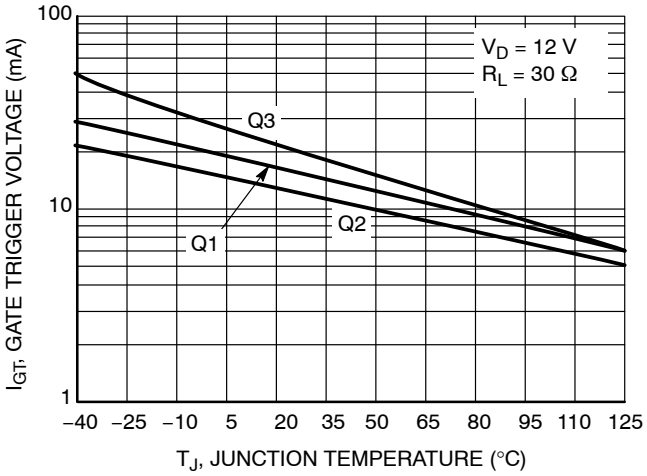


Figure 6. Gate Trigger Current Variation

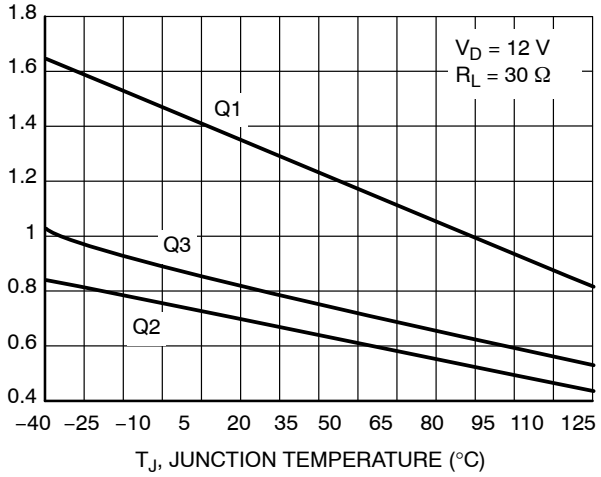


Figure 7. Gate Trigger Voltage Variation

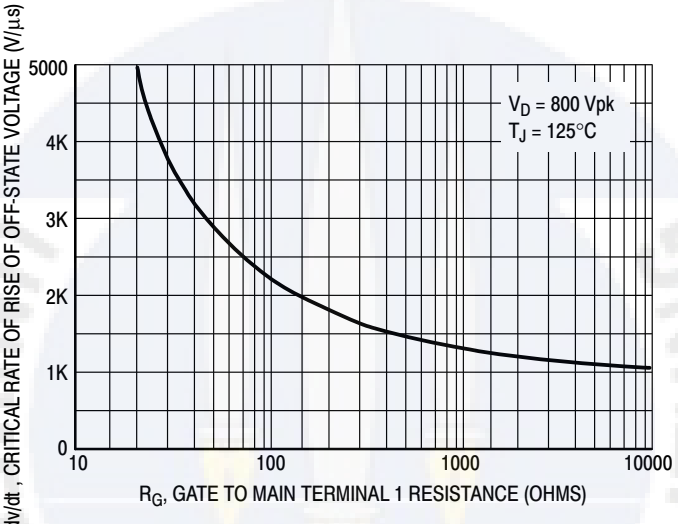
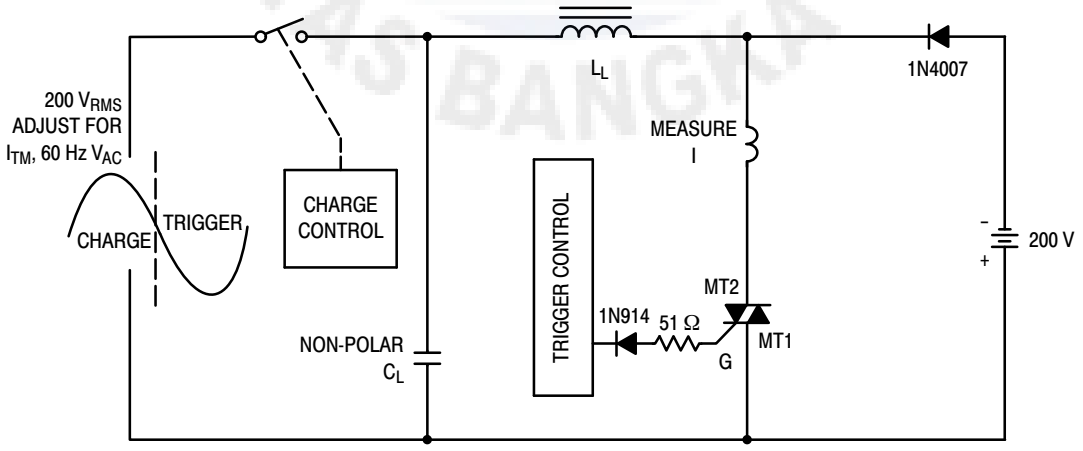


Figure 8. Critical Rate of Rise of Off-State Voltage (Exponential Waveform)

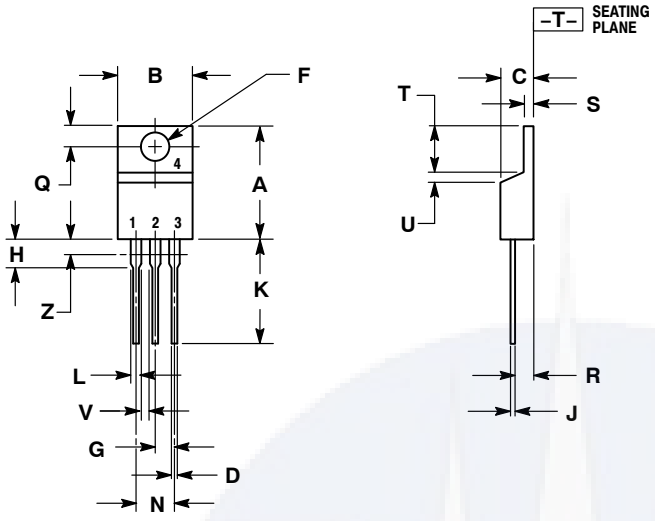


Note: Component values are for verification of rated $(di/dt)_c$. See AN1048 for additional information.

Figure 9. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Current $(di/dt)_c$

PACKAGE DIMENSIONS

TO−220
CASE 221A−07
ISSUE O



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.014	0.022	0.36	0.55
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 12:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. NOT CONNECTED

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
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ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative

DB3

TRIGGER DIODES (Package DO-35)

Description

High reliability glass passivation insuring parameter stability and against contamination.

Absolute Maximum Ratings (Ta=25°C)

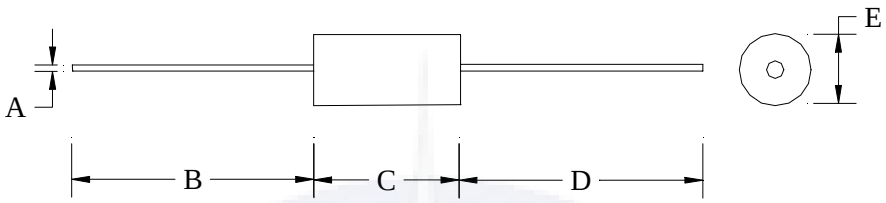
- Maximum Temperatures
  Storage Temperature ..... -40 ~ +125 °C
  Junction Temperature ..... -40 ~ +110 °C
- Maximum Power Dissipation
  Total Power Dissipation (Ta=25°C) ..... 150 mW
- Maximum Voltages and Currents
  Breakover Voltage ..... 32 V
  Breakover Voltage symmetry ..... ±3 V
  Repetitive peak on-state Current ..... 2 A

Characteristics (Ta=25°C)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
VBO	28	32	36	V	C=22nF
[|+VBO|]-[|-VBO|]	-	-	±3	V	C=22nF
IV±I	5	-	-	V	I=[IBO to IF=10mA]
VO	5	-	-	V	
IBO	-	-	50	uA	C=22nF
tr	-	1.5	-	uS	
IB	-	-	10	uA	VB=0.5 VBO max

*Pulse Test : Pulse Width ≤380us, Duty Cycle≤2%

DO-35(Glass) Dimension



DO-35 Glasses Package, HSMC Package Code : L

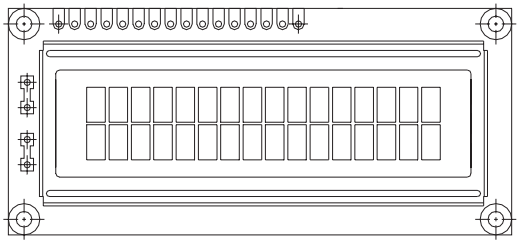
*:Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	ϕ0.0181	ϕ0.0220	ϕ0.46	ϕ0.56	D	0.9646	1.2811	24.50	32.54
B	0.9646	1.2811	24.50	32.54	E	ϕ0.0602	ϕ0.0787	ϕ1.53	ϕ2.00
C	0.1200	0.1700	3.05	4.20					

Head Office And Factory :

- **Head Office** (Hi-Sincerity Microelectronics Corp.) : 10F.,No. 61, Sec. 2, Chung-Shan N. Rd. Taipei Taiwan R.O.C.
  Tel : 886-2-25212056 Fax : 886-2-25632712, 25368454
- **Factory 1 :** No. 38, Kuang Fu S. Rd., Fu-Kou Hsin-Chu Industrial Park Hsin-Chu Taiwan. R.O.C
  Tel : 886-3-5983621~5 Fax : 886-3-5982931
- **Factory 2 :** No. 17-1, Ta-Tung Rd., Fu-Kou Hsin-Chu Industrial Park Hsin-Chu Taiwan. R.O.C
  Tel : 886-3-5977061 Fax : 886-3-5979220

16 x 2 Character LCD



FEATURES

- 5 x 8 dots with cursor
- Built-in controller (KS 0066 or Equivalent)
- + 5V power supply (Also available for + 3V)
- 1/16 duty cycle
- B/L to be driven by pin 1, pin 2 or pin 15, pin 16 or A.K (LED)
- N.V. optional for + 3V power supply

MECHANICAL DATA

ITEM	STANDARD VALUE	UNIT
Module Dimension	80.0 x 36.0	mm
Viewing Area	66.0 x 16.0	mm
Dot Size	0.56 x 0.66	mm
Character Size	2.96 x 5.56	mm

ABSOLUTE MAXIMUM RATING

ITEM	SYMBOL	STANDARD VALUE			UNIT
		MIN.	TYP.	MAX.	
Power Supply	VDD-VSS	- 0.3	–	7.0	V
Input Voltage	VI	- 0.3	–	VDD	V

NOTE: VSS = 0 Volt, VDD = 5.0 Volt

ELECTRICAL SPECIFICATIONS

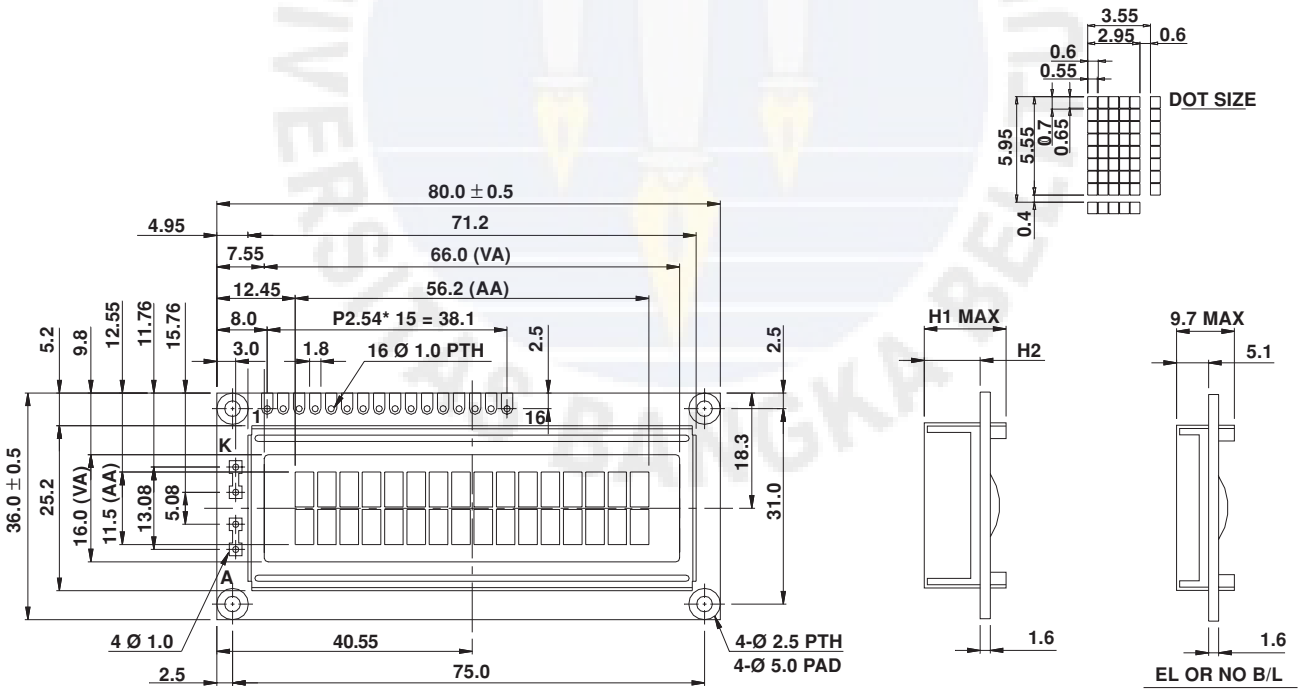
ITEM	SYMBOL	CONDITION		STANDARD VALUE			UNIT
				MIN.	TYP.	MAX.	
Input Voltage	VDD	VDD = + 5V		4.7	5.0	5.3	V
		VDD = + 3V		2.7	3.0	5.3	V
Supply Current	IDD	VDD = 5V		–	1.2	3.0	mA
Recommended LC Driving Voltage for Normal Temp. Version Module	VDD - V0	- 20 °C		–	–	–	V
		0°C		4.2	4.8	5.1	
		25°C		3.8	4.2	4.6	
		50°C		3.6	4.0	4.4	
		70°C		–	–	–	
LED Forward Voltage	VF	25°C		–	4.2	4.6	V
LED Forward Current	IF	25°C	Array	–	130	260	mA
			Edge	–	20	40	
EL Power Supply Current	IEL	Vel = 110VAC:400Hz		–	–	5.0	mA

DISPLAY CHARACTER ADDRESS CODE:

Display Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01														0F
DD RAM Address	40	41														4F

PIN NUMBER	SYMBOL	FUNCTION
1	Vss	GND
2	Vdd	+ 3V or + 5V
3	Vo	Contrast Adjustment
4	RS	H/L Register Select Signal
5	R/$\overline{W}$	H/L Read/Write Signal
6	E	H →L Enable Signal
7	DB0	H/L Data Bus Line
8	DB1	H/L Data Bus Line
9	DB2	H/L Data Bus Line
10	DB3	H/L Data Bus Line
11	DB4	H/L Data Bus Line
12	DB5	H/L Data Bus Line
13	DB6	H/L Data Bus Line
14	DB7	H/L Data Bus Line
15	A/Vee	+ 4.2V for LED/Negative Voltage Output
16	K	Power Supply for B/L (OV)

DIMENSIONS in millimeters



LED - H/L B/L		
	HIGH	LOW
H1	13.2	12.1
H2	8.6	7.5

Perhitungan Tegangan Pada Beban Lampu Pijar

1. Sudut Penyulutan 30º

Untuk perhitungan tegangan pada beban dengan sudut penyulutan 30º dapat dilihat sebagai berikut :

a. Untuk tegangan keluaran pada beban

$$V_0 = V_S \sqrt{\frac{1}{\pi}(\pi - \alpha) + \frac{\sin(2.\alpha)}{2}}$$

$$= 220 \sqrt{\frac{1}{\pi}(\pi - \frac{\pi}{6}) + \frac{\sin(2.30^o)}{2}}$$

$$= 216{,}8\ V$$

b. Untuk Arus keluaran pada beban

$$I = \frac{V}{R} = \frac{216{,}8}{40} = 5{,}42\ A$$

c. Untuk Daya keluaran pada beban

$$P = V.I$$

$$= 216{,}8\ x\ 5{,}42$$

$$= 1175{,}1\ W$$

2. Sudut Penyulutan 60º

Untuk perhitungan tegangan pada beban dengan sudut penyulutan 60º dapat dilihat sebagai berikut :

d. Untuk tegangan keluaran pada beban

$$V_0 = V_S \sqrt{\frac{1}{\pi}(\pi - \alpha) + \frac{\sin(2.\alpha)}{2}}$$

$$= 220 \sqrt{\frac{1}{\pi}\left(\pi - \frac{\pi}{3}\right) + \frac{\sin(2.60^{o})}{2}}$$

$$= 197{,}4\ V$$

e. Untuk Arus keluaran pada beban

$$I = \frac{V}{R} = \frac{197{,}4}{40}$$

$$= 4{,}9\ A$$

f. Untuk Daya keluaran pada beban

$$P = V.I$$

$$= 197{,}4\ x\ 4{,}9$$

$$= 967{,}26\ W$$

3. Sudut Penyulutan 90º

Untuk perhitungan tegangan pada beban dengan sudut penyulutan 90º dapat dilihat sebagai berikut :

g. Untuk tegangan keluaran pada beban

$$V_0 = V_S \sqrt{\frac{1}{\pi}\left(\pi - \alpha\right) + \frac{\sin(2.\alpha)}{2}}$$

$$= 220 \sqrt{\frac{1}{\pi}\left(\pi - \frac{\pi}{2}\right) + \frac{\sin(2.90^{o})}{2}}$$

$$= 155{,}6\ V$$

h. Untuk Arus keluaran pada beban

$$I = \frac{V}{R} = \frac{155{,}6}{40}$$

$$= 3{,}9\ A$$

i. Untuk Daya keluaran pada beban

$$P = V.I$$

$$= 155{,}6\ x\ 3{,}9$$

$$= 606{,}9\ W$$

4. Sudut Penyulutan 120º

Untuk perhitungan tegangan pada beban dengan sudut penyulutan 120º dapat dilihat sebagai berikut :

j. Untuk tegangan keluaran pada beban

$$V_0 = V_s \sqrt{\frac{1}{\pi}\ (\pi - \alpha) + \frac{\sin(2.\alpha)}{2}}$$

$$= 220 \sqrt{\frac{1}{\pi}\ (\pi - \frac{2\pi}{3}) + \frac{\sin(2.120^{o})}{2}}$$

$$= 155{,}6\ V$$

k. Untuk Arus keluaran pada beban

$$I = \frac{V}{R} = \frac{155{,}6}{40}$$

$$= 3{,}9\ A$$

l. Untuk Daya keluaran pada beban

$$P = V.I$$

$$= 155{,}6\ x\ 3{,}9$$

$$= 606{,}9\ W$$

5. Sudut Penyulutan 150º

Untuk perhitungan tegangan pada beban dengan sudut penyulutan 150º dapat dilihat sebagai berikut :

m. Untuk tegangan keluaran pada beban

$$V_0 = V_S \sqrt{\frac{1}{\pi}\ (\pi - \alpha) + \frac{\sin(2.\alpha)}{2}}$$

$$= 220 \sqrt{\frac{1}{\pi}\ (\pi - \frac{5\pi}{6}) + \frac{\sin(2.150º)}{2}}$$

$$= 37{,}35\ V$$

n. Untuk Arus keluaran pada beban

$$I = \frac{V}{R} = \frac{37{,}35}{40} = 0{,}93\ A$$

o. Untuk Daya keluaran pada beban

$$P = V.I$$

$$= 37{,}35\ x\ 0{,}93 = 34{,}8\ W$$

6. Sudut Penyulutan 180º

Untuk perhitungan tegangan pada beban dengan sudut penyulutan 180º dapat dilihat sebagai berikut :

p. Untuk tegangan keluaran pada beban

$$V_0 = V_S \sqrt{\frac{1}{\pi}\ (\pi - \alpha) + \frac{\sin(2.\alpha)}{2}}$$

$$= 220 \sqrt{\frac{1}{\pi}\ (\pi - \pi) + \frac{\sin(2.180º)}{2}}$$

$$= 0\ V$$

q. Untuk Arus keluaran pada beban

$$I = \frac{V}{R} = \frac{0}{40}$$

$$= 0\,A$$

r. Untuk Daya keluaran pada beban

$$P = V.I$$

$$= 0$$

$$= 606{,}9\,W$$